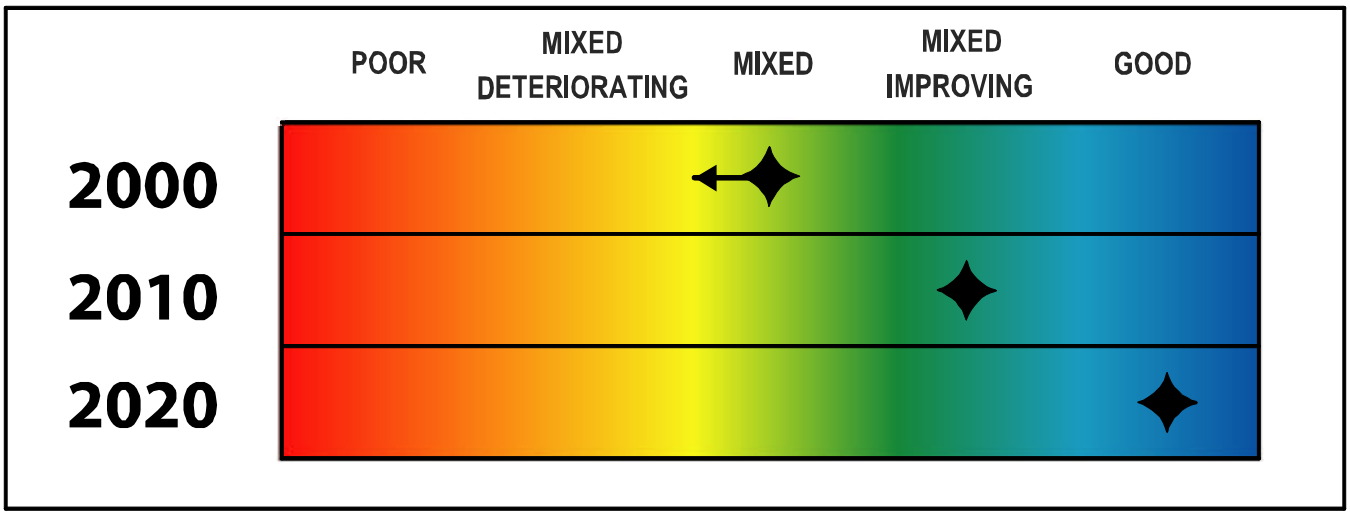
Subgoal 4

Are all habitats healthy, naturally diverse, and sufficient to sustain viable biological communities?



Status

The Lake Michigan ecosystem continues to experience profound changes because of development, impacts of nuisance species, and pollutant loading. Overall, the status of Lake Michigan habitats, including open water, wetlands (coastal and inland), coastal shore, tributaries, lakeplains, and inland terrestrial systems, is mixed to deteriorating. Many species' habitats rank as globally rare or imperiled based on their restricted distribution, the level of threat, their ecological fragility, and widespread damage or because they are part of the single largest source of fresh surface water in the world. This section assesses the status of each of the general habitat types in the Lake Michigan ecosystem and highlights significant events since the issuance of LaMP 2000. This assessment includes an overview of continuing trends in habitat loss and decreased biodiversity as well as the impacts of aquatic nuisance species.

Challenges

- To make habitat information on status and value readily available.
- To build on the above challenge to promote projects, to identify, enhance, restore, or protect critical ecosystem features and habitat through purchase or voluntary protection or improved management.

Open Lake System

The open lake waters of Lake Michigan consist of both nearshore and offshore waters, including all waters from the offshore edge of coastal wetlands lakeward. Significant changes in the lake ecosystem began in the mid-1800s when large numbers of people began to settle and develop the region. Multiple stressors continue to negatively impact the open lake ecosystem. The status of this ecosystem is changing and is heavily dependent on human management through predator fish stocking and control of exotic species such as the sea lamprey and zebra mussel.

Fish communities represent the highest trophic levels within the Lake Michigan aquatic ecosystem. They are also the most visible indicators of ecosystem health and to most people, they represent one of the most important resources of the lake. Originally, Coregonids (including lake whitefish, lake herring, chubs, and ciscoes) dominated the fish communities,

successfully inhabiting the many niches within the lake. Following the introduction of the sea lamprey in the 1950s, the population of top predator fish (such as lake trout and burbot) were decimated, and exotic species such as the alewife and rainbow smelt flourished. The alteration of fish communities has been the most obvious impairment to the aquatic ecosystem of Lake Michigan.

Threats to the Top of the Food Chain

The Lake Trout

Lake trout *(Salvelinus namaycush)* is a North American salmonid that thrives in cold, fresh water. Following the retreat of the last glacier, the lake trout colonized Lake Michigan, and over the subsequent 10,000 years or so, it became the top predator in a complex ecosystem that co-evolved with the other fish species.

During the 1800s, Commercial fishing for lake trout also became an industry, and by the beginning of the 20th century, the lake trout population was in decline. The decline continued until the mid-1950s, when predation by sea lamprey, overfishing, and the effects of industrial pollution

Lake Trout
Photo Courtesy of the Ontario Department of Fisheries and Oceans

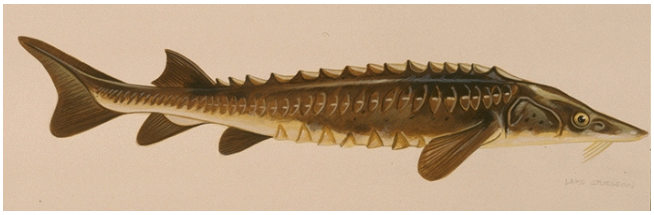
led to the destruction of lake trout fisheries and the disappearance forever of many of the strains of lake trout that had evolved in the lake.

Currently, federal, state and tribal management agencies around the lake are attempting to re-establish naturally reproducing populations of lake trout by planting yearlings and eggs in historical spawning areas. Assessments indicate that self-sustaining populations of lake trout have yet to be established. Research into the reasons for this failure are ongoing, but may include:

- Loss of suitable spawning habitat
- Environmental contaminants
- Predation on larval lake trout by alewife
- Thiamine deficiency from a diet of alewife
- Loss of genetically distinct strains

The Lake Sturgeon

Eight species of sturgeon live in American waters today. Four are endangered and another is threatened. Unlike most other fish, sturgeon mature late and reproduce slowly. Sturgeons survive in the Great Lakes only in scattered remnants, even though large-scale commercial fishing for them ended a century ago.



Lake Sturgeon
Figure Courtesy of the Ontario Department of Fisheries and Oceans

Lake sturgeon populations in Lake Michigan continue to sustain themselves at a small fraction of their historic abundance. Based on available data, an optimistic estimate of the lakewide abundance of adult lake sturgeon is below 5,000 fish, well below 1% of the most conservative estimates of historic abundance. Remnant populations currently are known to spawn in waters of at least 8 tributaries having unimpeded connections to Lake Michigan. Estimates of spawner abundance in these rivers range from just a few fish to several hundred annually. Successful reproduction has been documented in six tributaries to date, though it is suspected in several others.

There are currently 16 agencies and institutions involved with investigations of lake sturgeon in Lake Michigan, including determining the status of known and suspected remnant spawning populations. Reintroduction efforts have been ongoing in upriver reaches of the Menominee and Wolf rivers for several years and were initiated in the Milwaukee and Manitowoc rivers in 2003. A

Lake Sturgeon Task Group has been formed under the auspices of the Lake Michigan Committee to develop and coordinate the implementation of a lake-wide lake sturgeon rehabilitation plan for Lake Michigan. More information is available at: *http://greatlakes.fws.gov/GLSturgeonCoordMttg02.pdf*

Threats to the Food Web Foundation

The plankton communities (microscopic plant and animals) of Lake Michigan are the foundation of the food web and therefore are one of the most critical components of the lake's ecosystem. Changes to these communities may be occurring as a result of the presence of contaminants and nutrients in the water and sediment as well as exotic species such as the spiny water flea (*Bythotrephes cederstroemi*) and the zebra mussel (*Dreissena polymorpha*).

The abundance and types of phytoplankton are highly variable within the lake, depending on the time of year, area of the lake, and availability of phosphorus and other nutrients. They are generally found throughout the open lake waters to the depths of light penetration. The amount of phosphorus in the lake has been the most important man-induced change to phytoplankton communities, especially in nearshore areas. In addition, studies indicate that increased salinity and other environmental changes in Lake Michigan are enabling nonindigenous animals and algae to adapt more readily to the Great Lakes environment.

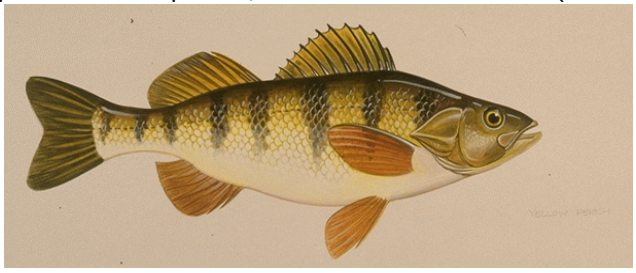
Zooplankton communities include many different invertebrates and comprise the bulk of the planktivorous fish diet. Because most zooplankton feed on phytoplankton, their abundance and geographic occurrence are similarly dependent upon water temperature, seasonal changes, and food availability. Zooplankton colonize open

Status of Perch

A large decline in the number of yellow perch surviving their first year of life (young-of-the-year or YOY) has caused a reduction in the number of perch in Lake Michigan with serious effects on the sport fishing industry. The number of YOY perch captured lakewide has dropped dramatically since 1988. The number of yellow perch larvae captured at one site in Illinois has severely declined since 1994. Data from one site, however, cannot be used to decide what has happened lakewide. Therefore, WDNR along with other agencies and scientists has used a variety of assessments to analyze the status of the current yellow perch population. These assessments have focused on (1) egg deposition, (2) spawning, (3) post-larval perch, (4) YOY perch, and (5) winter-graded mesh gill net assessment.

Although more information is needed, these studies may indicate some recovery in the yellow perch population:

- In 2002, the LaMP update reported that the number of yellow perch egg masses found in spawning areas in the lake increased from 0.5 per 1,000 square meters (m^2) searched in 1997 to 7.29 per 1,000 m^2 searched in 2001. That number increased to 11.53 per 1000 square meters in 2002.
- In 1998, a total of 4,512 yellow perch were captured during a spawning assessment, of which only 221 or 4.9 percent were females. In 2001, a total of 1,431 yellow perch were captured; 993 were males, and 438 (31 percent) were females. The percentage of females captured in 2002 dropped to 11 percent of 1812 total captured.
- The trend to detect the 1998 year-class continued . The largest year-class detected was once again from 1998 represented by 118 yellow perch observed as 4 year old fish in 2002. The represents the most 4 year old yellow perch caught since 1999 but is much lower than was found in the early 1990's. The majority of yellow perch in the population are 4 year old fish. The increase in egg masses found during the summer of 2002 indicates that most of the 4 year old females are mature and represent the best chance to produce another good year class.



Courtesy of the Ontario Department of Fisheries and Oceans

For more information, see http://dnr.wi.gov/org/water/fhp/fish/lakemich/YELLOWPERCH.htm

waters from the surface to the lakebed. Research conducted in the past 15 years indicates that zooplankton populations such as *Daphnia*, may be experiencing changes induced by *Bythotrephes*, an exotic species.

The *Diporeia spp.*, also known as scuds, sideswimmers, beach hoppers, and sand fleas, belong to the group of invertebrates called amphipods and are about 0.5 inch long. *Diporeia* have inhabited Lake Michigan since the Great Lakes were formed 5,000 to 10,000 years ago, and they are environmentally sensitive, thriving only in clean, cold, well-oxygenated water. *Diporeia* are eaten by a variety of Great Lakes fish and provide an important energy source because they contain high amounts of fat.

The numbers and density of these amphipods is decreasing in Lake Michigan (see Figure 4-2). While scientists have not yet determined the exact cause of the disappearance of the amphipods, they suspect it is linked to the introduction of zebra mussels in Lake Michigan in 1989, severely limiting the food available to *Diporeia*.

***Diporeia spp.*,**
Photo courtesy of GLERL

In addition, zebra mussels appear to be having a significant impact on benthic (bottom-dwelling) community structures and plankton abundance. Zebra mussels, which can attach themselves to any hard surface in the lake, have reached densities higher than 16,000/m^2 in southern Lake Michigan. Negative impacts of their presence include increased food competition (at the expense of fish fry) for nearshore fish species (such as yellow perch), increased biomagnification of contaminants in fish eaters feeding on organisms that eat benthic

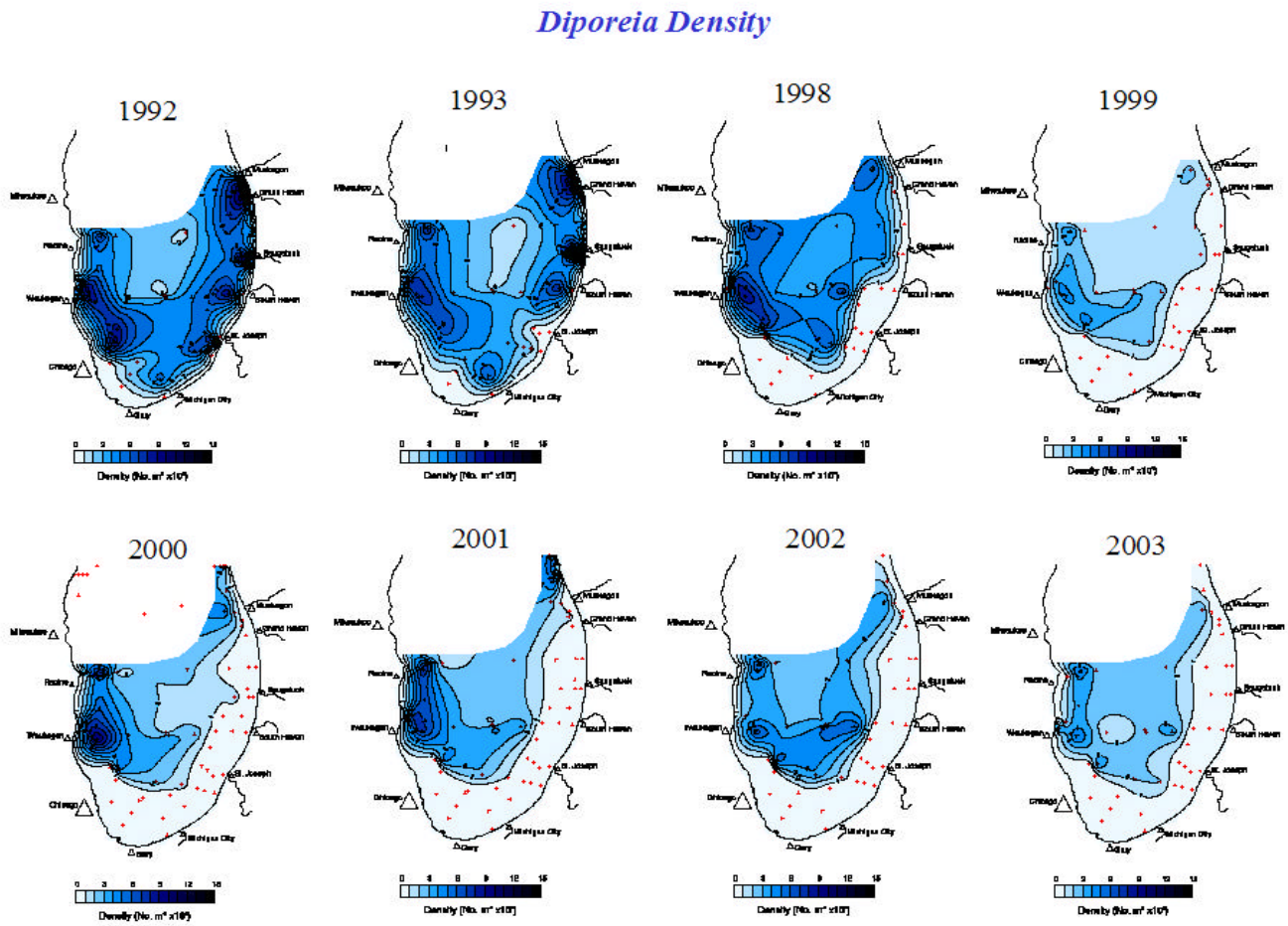


Figure 4-1 Diporeia density
Source: NOAA GLERL

organisms, and possible zebra mussel-induced mycrocystis blooms, which affect taste and odor in the water.

Coastal and Inland Wetland Systems

The coastal wetland system supports the greatest biological diversity and productivity in the Lake Michigan basin. Coastal wetlands are classified as open shoreline; unrestricted bays; shallow, sloping beach; restricted riverine; lake-connected inland; and protected or barrier beach. These wetlands are important because they collect nutrients and organic materials that are washed off the land into tributaries. These wetlands support both the aquatic food web and habitats for birds (resident and migratory), mammals, reptiles, amphibians, fish, and invertebrates, all of which depend on coastal wetlands for at least one life stage. Both lake level fluctuations and longshore sediment transport are important in maintaining this highly productive system.

Coastal wetlands differ from inland wetlands in that they are shaped by lake processes such as waves, wind tides, and water level fluctuations. These processes result in constant shifting of the wetland communities, permitting hardy species able to accommodate such conditions to survive while eliminating other species that would thrive under stable conditions. Multiple stressors continue to degrade the Lake Michigan coastal wetland system. Nonindigenous species, such as purple loosestrife, are still largely uncontrolled despite attempts to eradicate them. Changes in sediment composition and deposition have affected the habitat types, productivity, and diversity of these wetlands. The pace of shoreline modification is increasing, and there are no coordinated stewardship activities to protect or restore the remaining fragments.

The inland wetland system—wetlands away from the Lake Michigan shoreline—is a reservoir for water in the Lake Michigan drainage basin. There are many types of inland wetlands, including fens, bogs, wet meadows, and wet forests. The health of inland wetlands depends on the quantity and quality of groundwater and surface water present. Inland wetlands help to regulate the basin's volume of water as well as sediment and certain pollutant loads. They also store nutrients and serve as the nutrient exchange vehicle for the diverse species that use inland wetlands as habitat and feeding areas. Both wetland and upland species breed and feed in the Lake Michigan basin's inland wetlands.

Millions of acres of inland wetlands have been lost in the Lake Michigan basin to agriculture, industry, and urban development. Over the last two centuries, wetland losses in the four states at least partially within the Lake Michigan basin have been disproportionately greater than in many other U.S. regions. Since the 18th century, Lake Michigan basin states have lost an estimated 21.9 million acres (62.9 percent) of their wetlands out of the original 34.8 million wetland acres. This compares with an average loss of 52.8 percent nationwide. An estimated 12.9 million acres of wetlands remains in the four states, representing more than 12.3 percent of the wetlands within the lower 48 states.

Changes in Wetland Regulation: Impact of the Supreme Court Ruling

In January 2001, the U.S. Supreme Court, in the case of *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* (commonly referred to as to "SWANCC") narrowed federal authority to protect certain types of wetlands. The court's five-to-four decision narrowed the U.S. Army Corps of Engineers (USACE) regulating authority for wetlands not associated with waters of the United States such as a lake, stream, or river.

The Court's decision overturned the USACE's assertion of federal jurisdiction over certain isolated wetlands based on the presence of migratory birds. EPA and the Corps responded by issuing revised guidance to their field offices. At the same time, the Agencies reaffirmed federal jurisdiction over the majority of wetlands not impacted by the decision.

The court's decision came in response to a landfill battle in northern Illinois. The regional solid waste disposal authority sought to fill a wetland for its new landfill. The wetland in question was actually

Great Lakes Wetland Consortium

The Great Lakes Wetland Consortium was launched in December 2000 with a cooperative agreement between EPA GLNPO and the Great Lakes Commission with more than 40 participating organizations. It began by testing scientific methods and indicators of coastal wetland integrity (Phase I),is currently developing a classified inventory of Great Lakes coastal wetlands and a data collection system (Phase II), and will conclude by planning and implementing a Great Lakes coastal wetlands monitoring program (Phase III). The Consortium is designing standard protocols and delineating benchmarks for the implementation of a binational/basinwide monitoring program capable of tracking and assessing the existing status and projected integrity of Great Lakes coastal wetlands. The program will serve as decision support for programs and policies affecting the conservation and management of Great Lakes coastal wetlands.

Consortium Timeline

The Consortium is in the first phase of its program. The timeline for completion of its work is as follows.

Phase I
Evaluate scientific indicators for wetlands monitoring, including biological, physical, chemical, and landscape measures. Each indicator is evaluated against seven criteria: Cost, measurability, data availability, sensitivity to wetland condition changes, basin-wide applicability, ability to set endpoint or attainment levels, and statistical approach.

The Consortium awarded $300,000 in small grants to six research teams for pilot studies at more than 30 wetland sites across the Great Lakes basin to test the indicators.

Phase II
- Develop a comprehensive Great Lakes Coastal Wetlands Inventory, using existing data
- Develop a geomorphically-based classification system for the inventory, incorporating a standard
- classification process
- Evaluate and verify methods for collecting basinwide information in order to address landscape-level and wetland contamination indicators
- Assess results of Phase I pilot studies, including gap analysis and indicator development work plan
- Develop an overall monitoring plan, including specifications for site selection, data collection, storage, analysis, and reporting

Phase III
1. Develop a monitoring database
2. Develop an implementation plan
3. Coordinate implementation with Consortium member organizations

created when an abandoned quarry filled with water and over time, the new wetland became a nesting spot for migratory waterfowl. The landfill proponents were able to successfully argue that USACE lacked regulatory authority to prohibit creation of the new landfill because the wetland was not linked to waters of the United States. The court ruled that the USACE must provide a nexus other than solely migratory bird stopovers.

The ruling now places the responsibility for protecting certain isolated wetlands primarily in the hands of state and local authorities. The results are mixed. Wisconsin passed a law protecting these wetlands in 2002. Antrim County, Michigan first passed, and then repealed an ordinance that would have protected isolated wetlands. Michigan Governor Jennifer Granholm issued an Executive Order in January 2004 directing the Department of Environmental Quality to promulgate a rule to protect isolated wetlands on state-owned land from development. Two examples of this change in state and local roles are found in Wisconsin and in Antrim County, Michigan (see box).

In December 2003, EPA and the USACE announced that they would not issue a new rule that would have withdrawn federal regulatory jurisdiction over isolated wetlands. After soliciting

public comment to determine if further regulatory clarification was needed, the EPA and the Corps decided to preserve the federal government's authority to protect wetlands. The agencies will continue to monitor implementation of this important program to ensure its effectiveness.

The federal government currently implements 30 programs to protect and restore millions of acres of wetlands. These include the Food Security Act's "Swampbuster" requirements and the Wetlands Reserve Program, both under the authority of the U.S. Department of Agriculture. EPA programs include its "Five-Star Restoration" grant program, the EPA wetlands grants programs and the National Estuary Program. Other federal programs include: the Fish and Wildlife Service's "Partners in for Wildlife" program, the National Marine Fisheries Service's Coastal Wetlands Restoration Program and the Migratory Bird Conservation Commission, composed of the Secretaries of Interior and Agriculture, the Administrator of EPA, and Members of Congress.

Coastal Shore System

The Lake Michigan coastal shore system includes sand dunes, sand beaches, sand spits, bluffs, bedrock and cobble beaches, alvars, and islands. These features buffer coastal wetlands and inland ecosystems from Lake Michigan waves, wind, and ice. These habitats are rich in species diversity but are greatly affected by natural processes such as weather, erosion, and lake level fluctuations.

Sand Beaches

Sand beaches are a prominent coastal Lake Michigan feature. They may be erosional,

Wisconsin Wetland Law

On May 9, 2001, Wisconsin Governor Scott McCallum signed the nation's first state law designed to protect wetlands from the effects of the Supreme Court ruling that left some categories of wetlands largely unprotected. The Wisconsin law is expected to become a template for other states' efforts to step up wetland preservation. The law covers at least 1 million acres of wetlands, among them sedge meadows, shallow marshes, and seasonal wetlands that are among some of the state's most productive in providing waterfowl and amphibian habitat, storing flood waters, and helping to protect water quality. The law will not impose any new regulations on landowners but allows the state to continue following the same process that was used for the past decade to decide whether a project that potentially affects wetlands can proceed.

Since the January 9, 2001, Supreme Court ruling, USACE has informed 37 Wisconsin applicants that it has no jurisdiction over wetlands that the applicant's projects affected. A handful of applicants had already filled or excavated the wetlands by May 1, 2001. Those applicants who had been notified that the USACE did not have jurisdiction over their wetlands but who had not yet filled or dredged their wetlands must now await approval from WDNR and any applicable local government body before beginning any filling or dredging.

Wisconsin's law gives WDNR the authority to protect isolated wetlands in Wisconsin that the USACE has no jurisdiction over as a result of the Supreme Court's ruling. No person can fill or dredge such a wetland unless the state certifies that the project meets Wisconsin's water quality standards for wetlands.

Antrim County, Michigan, Wetland Protection Ordinance Rescinded

The Antrim County Board of Commissioners adopted an Ordinance for the Protection and Regulation of Wetland Areas in the county at its regular meeting on December 13, 2001. The ordinance was rescinded by the County Board on October 10, 2002. Fear of a "takings" lawsuit (if a property owner was denied the right to build and sued), creating an extra layer of government, and duplication of state enforcement efforts were the reasons stated for rescinding the ordinance.

Implementation of the ordinance would have meant that the county would have local control over the protection of wetlands as a valuable resource. Additionally, the ordinance would have provided the authority to regulate the wetlands contiguous to lakes and streams and the authority to regulate other wetlands that are not connected to a water body.

transitory, or depositional. Shoals, sandbars, and sand spits protect lagoons and coastal marshes from wind and wave action. Artificial shoreline structures and hardening of the shoreline have interrupted the longshore sediment transport that naturally erodes and replenishes sand beaches. In many areas, tons of sand are brought in each year to artificially replenish beaches for recreational purposes. Beach closure problems caused by excessive levels of pathogens are discussed in Section 4.

Tributary System

Tributary streams and rivers are connected to Lake Michigan in several ways. Energy and material are transferred from lake to tributary and tributary to lake by means of fish movement upstream and downstream and by waters carrying material and nutrients downstream. Diverse plant and animal habitats are found throughout the tributary system, and many of these habitats accommodate Lake Michigan fish. The range of tributary habitats present depends on the size, slope, substrate, and geology of the drainage basin; basin land use; groundwater characteristics; the climate; and the nature of the terrestrial vegetation. The connection of the streams and rivers to the lake maximizes the biodiversity and production of fish in the lake.

The quality of many tributary rivers in the Lake Michigan basin has been significantly impaired by channelization, dredging, damming, sedimentation, bankside vegetation loss, eutrophication, increased spring flooding, and toxic contamination. Large areas of inland forests and wetlands that once served to regulate the quantity and quality of water flowing into tributaries have been lost. As a result, tributaries carry increased pollutant and sediment loads to the lakes, and the suitability of those tributaries as fish spawning habitats has been seriously impaired. Habitat degradation has been the most severe in urban areas. Pollution from agriculture, industry, and urban development has contaminated rivers and sediment as well as the fish and wildlife that depend on those rivers. Many rivers, particularly at the rivermouths, have been declared AOCs and many of their beneficial uses have been impaired.

Although the public uses many Lake Michigan basin rivers and streams, the uses are not necessarily sustainable at this time. Progress is being made in improving and protecting tributary rivers and streams, largely through the efforts of watershed groups and remedial actions at AOCs. For information on Lake Michigan tributaries, Surf Your Watershed at *www.epa.gov/surf*. See also Appendix D for more information on Lake Michigan watersheds.

Lakeplain System

The lakeplain system occupies the area of the ancestral lakebed of Lake Michigan that was formed as the last glaciers receded. This lakeplain system has served two important ecological functions: it provided a refuge during severe weather events, and it was historically important in flood water retention. The system once harbored a rich diversity of plants and animals, several of which appear on the federal endangered species list. Lakeplain prairies and savannas, two of the most imperiled ecological communities in North America, are found in the southern Lake Michigan basin.

The lakeplain system has been largely transformed since European settlement began. Many of the original plants and animals survive only in small, previously protected areas that are no longer viable or sufficient to sustain these historically diverse communities. These communities are still threatened by human development and by invasive species.

Inland Terrestrial System

The inland terrestrial, or upland, system of Lake Michigan includes numerous types of forests, barrens, and prairies. These areas are a result of glaciation and climatic effects. Oak and pine barrens found in the northern part of the basin are globally significant and rare ecological communities.

One of the significant inland terrestrial features of the Lake Michigan basin is the Niagara Cuesta, a rocky outcrop of dolomite and limestone that arcs from the Door County peninsula and the Garden Peninsula to Niagara Falls. Many rare land snails, some of which were only recently

Dam Removals in Southeastern Wisconsin Improve Fish Habitat

The Chair Factory dam on the Milwaukee River was removed in 2000, In 2003, Wisconsin state environmental researchers have found that there are more and a greater variety of fish than ever before found in that section of the Milwaukee River in Grafton, Wisconsin.

The removal of the barriers allows fish to move more freely in the stream and provides a more diverse bottom habitat, with sections of stone and gravel, than is found in the muddy pond of an impoundment. It also increased the flow of the river, once dominated by carp when it was a slow flowing, murky artificial lake. There are now more than a dozen fish species, including smallmouth bass of all sizes, golden and shorthead redhorse, rock bass, emerald and spotfin shiners, hornyhead chub, and the rare greater redhorse. These species are not tolerant of muddy water and were not

Shorthead redhorse
Courtesy of NOAA

found in that stretch of the river previously.

Removal of the North Ave. dam in Milwaukee in 1997 allowed the stream to establish a more narrow, meandering channel through the former impoundment, and invited fish and aquatic insects not tolerant of pollution. Two other dams on the Milwaukee River were removed: at Waubeka in 2003 and at New Fane in the Northern Unit of the Kettle Moraine in 2002.

discovered, inhabit the thin- layered soils and rocks of the escarpment. Increased tourism in Door County and on the Garden Peninsula has led to increased development on the escarpment, threatening these fragile habitats.

Coastal Wetlands

Lacustrine (controlled directly by the waters of the Great Lakes), riverine (occurring in rivers and creeks that flow into or between the Great Lakes), and barrier-protected (separated from the lakes by a barrier with periodic breaches) coastal wetlands can be found throughout the Lake Michigan basin. At this time, the status of the ecological health of Lake Michigan coastal wetlands is unknown. However, recent Michigan legislation and stewardship efforts are impacting coastal wetland health, and scientists and managers are working to increase our ability to monitor them.

In 2003, Michigan enacted Public Act 14, amending the Natural Resources and Environmental Protection Act to allow beach maintenance activities without a permit in areas classified as wetlands or submerged lands. Private property owners are now able to groom their beaches during low water levels. Currently, these activities are regulated by the Michigan Department of Environmental Quality and the U.S. Army Corps of Engineers. The Michigan Departments of Environmental Quality and Natural Resources, as well as many other agencies and environmental groups, objected to the legislation because "beach grooming" is synonymous with wetland vegetation removal. Removal will result in loss of habitat for wetland species and the erosion of natural shoreline features.

In Door County, 12 agencies and organizations developed *A Guide to Significant Wildlife Habitat and Natural Areas of Wisconsin* in 2003. This Guide provides the location, site description, ecological significance, threats and conservation goals for significant natural areas, including coastal wetlands like the Mink River Estuary. The Mink River Estuary is one of the larger coastal wetlands on Lake Michigan, significant for its rare plant communities and lack of human disturbance. Threats include groundwater quality, surface water runoff for impervious surfaces, non-native invasive species, and home development adjacent to this protected area. Immediate conservation goals are to enhance wildlife corridors and control aggressive non-native

Little River Band of Ottawa Indians Awarded National Watershed Grant to Protect the Manistee River

To support community-driven initiatives that protect habitat, improve water quality, and enhance outdoor recreation, the EPA awarded $15 million in grants to 20 watershed organizations selected as part of a new Watershed Initiative in 2003.

Among the watersheds selected was the Manistee River, Michigan through the Little River Band of Ottawa Indians, which is a tribe of 2,600 members. The river provides important resources, which are vital to the survival of the tribe. EPA awarded the tribe Watershed Initiative grant money to support their efforts to restore and monitor the water quality of the Manistee River. Planned projects include: repairing road and stream crossings, stream bank stabilization, extensive monitoring, habitat inventories, invertebrate surveys, fish assessment, and a sturgeon spawning site reclamation project.

Regional and national experts selected the winners from a highly competitive field of more than 176 nominations. The winners were chosen because they best demonstrated the ability to achieve on-the-ground environmental results in a short time frame. Each of these watershed organizations exhibited strong partnerships with a wide variety of support, showed innovation, and demonstrated compatibility with existing governmental programs.

species (*A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin. March 2003)*.

Lake Michigan Islands

More than 30,000 islands throughout the Laurentian Great Lakes form the world's largest freshwater island system. The islands have unique landforms, plants and animals, and cultural history. Islands are vulnerable, sensitive to change, and irresistible to humans, whose impact to island natural communities is growing. The U.S. Fish and Wildlife Service (FWS) Great Lakes Basin Ecosystem Team incorporated conservation of islands as a management goal 2001. In 2003, the Great Lakes Island Collaborative was formed by the Northeast-Midwest Institute with FWS, The Nature Conservancy, and the Nature Conservancy of Canada and funded by USEPA's Great Lakes National Program Office. The Collaborative is creating a framework to ensure the long-term conservation of Great Lakes islands. An island biodiversity assessment tool is being finalized and will be used to assess and characterize the entire suite of Great Lakes islands. All islands are being mapped by FWS with data from many sources. Indicators of island health are being developed as part of the State of the Lakes Ecosystem Conference (SOLEC) indicator process. Conservation targets will be identified. Future implementation activities will be directed toward these targets.

Lake Michigan islands can be grouped into two archipelagoes. The Grand Traverse Islands are a chain of 19 islands in Lake Michigan and Green Bay around the Door Peninsula. The Beaver Islands are located in the north eastern part of the Lake. The status of Lake Michigan's islands is considered moderately degrading. Habitat loss due to human development and recreation, as well as invasive species, are the primary reasons for this conclusion.

The Grand Traverse Islands are part of the Niagara Escarpment and contain more than 850 acres of wetlands, primarily on the eastern and northwestern portions of Washington Island. Several of the islands are home to a rare natural community known as alvars, rocky, thin-soiled places with globally rare plants and animals. Island plant and animal data from 25-75 years ago was compared with recent inventories ((Judziewicz and Kopitzke 1999). Colonial waterbirds on the smaller islands and human development and white-tailed deer browsing in general have severely impacted vegetation over the last decade. A comprehensive ecological management plan to protect the rare natural communities and plant and animal species is one conservation goal put forth by Door County community collaborators.

Several islands in the Beaver Island group--Gull, Pismire, Hat, and Shoe—are part of the Michigan Islands National Wildlife Refuge. Administered by

Seney and Shiawassee National Wildlife Refuge staff, Beaver Islands habitats are varied from little or no ground cover to sand dunes and forested areas. Their 235 acres provide habitat for migratory birds and colonial nesting birds and are home to several federally threatened plants, the dwarf lake iris and the Pitcher's thistle. North and South Manitou Islands, the southern most islands in the Beaver Islands group are primarily managed by Sleeping Bear Dunes National Lakeshore.

Nearshore Aquatic Habitats/Fisheries

In March 2003, the Lake Michigan Committee of the Great Lakes Fishery Commission reported on the status of the Lake Michigan fishery. Issues of concern included salmonid reproduction, yellow perch recruitment and population dynamics, and development of fish health indicators and measures. In a September 2003 report by the Lake Trout Task Group, historically important lake trout spawning reefs are said to be degraded. Based on the issues outlined in the two reports, the status of the ecological health of Lake Michigan nearshore aquatic habitats and fisheries is poor.

The yellow perch population remains low with catch rates the lowest since the mid-1980s and 90s. Zebra mussels have declined in certain areas. Diporeia are now absent from major portions of the lake. Bloater chubs, alewife, and smelt have continued to decline. Sea lamprey populations have increased in abundance and are now higher than in Lakes Superior or Huron.

Lake sturgeon were stocked in the Milwaukee and Manitowoc, Wisconsin Rivers at undisclosed locations in 2003. In Illinois, the Shedd Aquarium proposed to stock about 200 older aged fish per year beginning in 2003. Some scientists and managers are concerned that stocked sturgeon will genetically impact the small remnant native populations. The Lake Michigan Committee and Great Lakes Fishery Trust will cooperate in promoting sturgeon rehabilitation efforts.

The Lake Trout Task Group identified 14 impediments to lake trout reproduction in Lake Michigan. Impediments to the size of the lake trout population are thought to be number of fish stocked, sea lamprey mortality, sport and commercial fishing, and the abundance of spawning fish on historically important reefs. Threats to the survival of lake trout include habitat degradation, contaminants, predation on eggs and fry by native and non-native predators, and mortality from early mortality syndrome. This synthesis of current knowledge and interpretation by the Task Group will be the basis for a new lake trout rehabilitation plan for Lake Michigan that will recognize technical, informational, and biological limitations but take full advantage of lessons learned from past experiences on Lake Michigan and the other Great Lakes.

Forests

The status of Lake Michigan basin forests is considered good due to current positive revisions to national forest plans and to the continued practice of sustainable forestry management by Menominee Tribal Enterprises.

In September 2003, the Hiawatha and Huron-Manistee National Forests published in the Federal Register a Notice of Intent to revise their forest plans. In the Hiawatha, since the last plan was approved by the Regional Forester in 1986, information about forest landscape functioning and capacity has been conducted and ecological units have been mapped. New plans will help to determine sites to manage old growth as well as lands suitable for harvest. In southern Michigan, the emerald ash borer is attacking native ash (genus *Fraxinus*) tree species, posing a threat to the Huron-Manistee.

Located on the transition zone between the central and northern hardwood forests, the Menominee Reservation forest lands total some 235,000 acres and 33 tree species, including northern hardwood, hemlock and pine. Menominee Forest Enterprises (MTE) is a tribal-owned business employing more than 300 people and dedicated to the culture, values, and spirituality of the tribe as stated by MTE Forest Manager Marshall Picore in the Journal of Forestry (July 1992):

"It is said of the Menominee that the sacredness of the land is their very body, the values of the

culture are their very soul, the water is their very blood. It is obvious, then, that the forest and its living creatures can be viewed as food for their existence."

Recognized as one of the finest examples of forest management in the Great Lakes basin, Menominee Tribal Enterprises is the recipient of numerous recent awards, including several in 2000: the U.S. Department of Commerce distinguished recognition award for "innovative economic development activities," and the National Arbor Day Foundation Good Steward Award. In 2003, MTE was honored with a Forest Stewardship Award from the National Hardwood Lumber Association (NLHA).

Shorelands

The Door County Natural Area Mapping Project began in 1998 with a commitment by conservation organizations, governmental agencies, and community members to identify, map, and describe the highest quality unprotected natural areas of Door County, Wisconsin. The project was initiated by a coalition of 6 conservation organizations (The Nature Conservancy, the Door County Land Trust, the Door County Environmental Council, the Gibraltar Preservation Commission, the Door Land Use Forum, and the Door Property Owners Association), several governmental agencies (U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, Door County Planning and Zoning Department, and Door County Soil and Water Conservation Department), the University of Wisconsin – Green Bay, University of Wisconsin – Extension, Bay-Lake Regional Planning Commission, several community members, and local elected officials. This has been an open and fluid group process facilitated by staff from the Door Office of The Nature Conservancy, the Door Land Use Forum, the WDNR, and the University of Wisconsin – Extension.

With the assistance of a small grant from the WDNR and donated time and material from the partners, a 202 page document entitled "A Guide to Significant Wildlife Habitat and Natural Areas of Door County, Wisconsin" was published in March 2003.

According to WDNR Bureau of Endangered Resources, Door County has both the highest number of state listed rare species and the highest density of such species per square mile of any county in Wisconsin. Door County also contains 22 State Natural Areas, two state wildlife areas, five state parks, six ecoregional conservation areas of The Nature Conservancy, a National Natural Landmark (the Ridges Sanctuary), a U. S. Fish & Wildlife National Wildlife Refuge, and several other locally protected sites of regional ecological significance.

This collaborative community project purpose has been to provide practical information that might assist citizens and civic and political leaders in supporting preservation and protection of those still unprotected natural landscapes in and around their communities. The Natural Areas Guide was the first step towards that end. The information in the guide is now being used by townships in their comprehensive plans, by local land trusts in their conservation planning projects, and by community citizen groups as a basis for increased community involvement in watershed and wetland protection. The group has also received funding from the EPA's Great Lakes Program to produce detailed site conservation plans at two of the landscapes identified in the project.

Repositories for the document include the county library system, county offices, WDNR, high schools, UW-Green Bay Biodiversity Center, Bay-Lake Regional Planning, and all other coalition member agencies and organizations.

Sand Dunes

Massive coastal sand dunes flank the Lake Michigan shoreline from northern Indiana continuing northeasterly through Michigan. Ancient high lake levels formed the beach ridges, and as the lake receded, the prevailing onshore winds continued to blow beach sand up the slopes. Lake Michigan is now home to the largest collection of freshwater sand dunes in the world. They run along the entire shore to heights of 300 feet and widths of more than 1 mile; they are interrupted only by river valleys, cities, and roads. The Lake Michigan dunes are numerous, diverse, and irreplaceable.

The dune system is composed of successive ridges of dunes: foredunes, interdunal areas, and backdunes (usually several). Dune and swale or ridge and swale community complexes are found at several locations throughout the Lake Michigan basin. In the south, the dunes or ridges run parallel to the Lake Michigan shore and are rich in oak savanna species. The wet swales between these ridges support rich prairies and sometimes rare coastal plain marsh communities. In the north, the ridges are typically dominated by red and white pine and other conifers, and the swales by white cedar swamps or sedge meadows. Sand dunes around Lake Michigan are threatened by residential development, often very close to the shore, and by mining. On the eastern shore of Lake Michigan, an invasive, nonindigenous species, Baby's breath, is threatening dune ecosystems. "Blowouts," which occur most frequently in the foredune area, are created when the vegetation is disrupted and the wind quickly erodes the sand, leaving a saucer-shaped depression. The most serious blowouts occur as a result of human activity.

Indiana Dunes
Courtesy of the Indiana National Lakeshore.

A recent report by the Lake Michigan Federation states that Lake Michigan has the largest concentration of freshwater sand dunes in the world. The dunes provide habitats for significant plant and animal species. In spite of the Michigan Sand Dune Protection and Management Act of 1976, this report reveals that the areas in which sand mining is permitted have increased and that more than 46.5 million tons of sand have been extracted since the law was passed.

Nature Conservancy Biodiversity Blueprint

This map shows places identified in the Conservation Blueprint for the Great Lakes that are critical to the conservation of biodivesity in the Great Lakes region. The Nature Conservancy (TNC) worked with more than 220 scientists and conservation experts and led a large-scale study to identify these lands and waters that are important for the preservation of the Great Lakes ecosystem. The Conservation Blueprint scientifically and systematically identifies native species, natural communities and aquatic systems characteristic of the region and determines where they need to be preserved to ensure their long-term survival. The map will be updated as TNC gains knowledge and understanding of the Great Lakes 'natural systems. The Conservation Blueprint is a framework for coordinated action. It guides The Nature Conservancy 's work in very Great Lakes state and is the logical foundation for conservation of biodiversity within the Great Lakes region. The Nature Conservancy of Canada is leading efforts to complete the Canadian portion of the Conservation Blueprint. For more information, please visit the Nature Conservancy's website at *www.nature.org/greatlakes.*

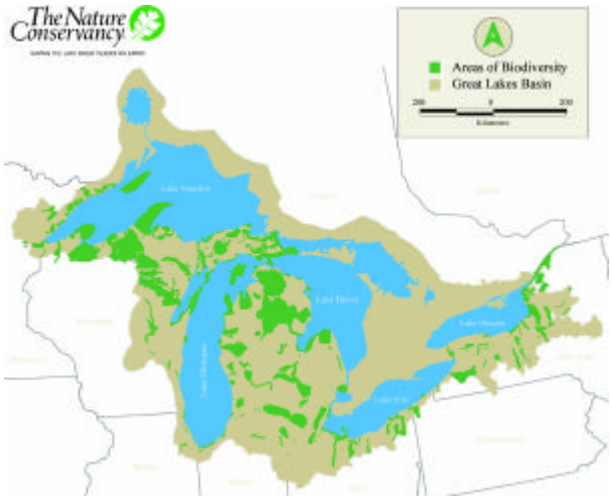


Figure 4-3 Areas of Biodiversity

Growing concern for the health and conservation of sand dunes lead to the formation of the Michigan Dune Alliance in 2000. The Alliance is a coalition of seven environmental organizations—Chickaming Open Lands, Grand Traverse Regional Land Conservancy, Leelanau Conservancy, Little Traverse Conservancy, Southwest Michigan Land Conservancy, and The Nature Conservancy—united by a commitment

Chicago Wilderness

Chicago Wilderness is a broad coalition of more than 150 agencies and organizations in Northeastern Illinois and Northwest Indiana formed to protect and restore native species and habitats in more than 250,000 acres of woodlands, wetlands, prairies, and dunes. Over the last several years, Chicago Wilderness members have produced numerous educational materials about restoration projects that are underway and the biodiversity of the region including Chicago Wilderness Magazine, Chicago Wilderness Journal, an Atlas of Biodiversity, an activity guide for families, and a Biodiversity Recovery Plan.

More than 180 projects have been funded across the region. The Illinois Biodiversity Basics and the Chicago Wilderness Training Hub are training educators to help in recovery of biodiversity. The Mighty Acorns Program has involved more than 250 teachers and 8,500 students in hands-on local native environment restoration. Future goals include improving the membership in the Corporate Council, strengthening ties among organizations in the three-state region, and completing the Chicago Wilderness State of the Region Report Card.

to protect unique shoreline systems, including sand dunes. The Alliance engaged in a comprehensive conservation planning process and developed an Eastern Lake Michigan Shoreline Plan. Currently, the group is identifying shoreline sites and compiling data that will be used to qualitatively rank criteria in order to prioritize areas for protection and restoration.

Wisconsin's Shorelands

The Wisconsin Shoreland Management Program, a partnership between the state and local governments, helps local communities to adopt zoning ordinances that mitigate the impacts of development near rivers and lakes. The goal is to protect water quality and fish and wildlife habitat, as well as provide recreational opportunities. Minimum standards for shoreland development are intended to control the intensity of development and create a vegetative buffer adjacent to water to protect it from impacts.

The Lake Michigan Shorelands Alliance, organized in 2003, is completing 12 site conservation strategy plans for eight Lake Michigan land trusts. The plans include stating key conservation goals, identifying and prioritizing core conservation areas and buffer zones, identifying threats and strategies to minimize the threats, and developing conservation implementation strategies. Gathering Water Conservancy has taken the lead in organizing the Alliance. The following land trusts are partners: Caledonia Conservancy, Door County Land Trust, Milwaukee Area Land Conservancy, Northeast Wisconsin Land Trust, Ozaukee Washington Land Trust, Sheboygan Area Land Conservancy, and The Nature Conservancy.

Great Lakes Environmental Indicators (GLEI)

The Great Lakes Environmental Indicators project (GLEI) is an EPA Office of Research and Development (Mid-Continent Ecology Division, Duluth, Minnesota) initiative to develop ecosystem or environmental indicators of conditions for the coasts of the United States. A binational consortium of 27 scientists from nine institutions is focusing on the Great Lakes shoreline. GLEI is examining the usefulness of State of the Lakes Ecosystem Conference (SOLEC) indicators as well as indicators from other efforts and developing new indicators as needed to report on the health of the Great Lakes coastline.

Tributaries

Information on Lake Michigan's tributary watersheds is presented in Appendix D in a series of fact sheets. These fact sheets address key management activities in the tributary watersheds. For example, The Great Lakes Fishery Trust and its Scientific Advisory Team selected the Muskegon River watershed to develop a model approach to integrated ecosystem fishery-habitat management. The Muskegon is one of the largest watersheds in the state of Michigan, covering a great part of nine counties. The total watershed area is 2,660 square miles. Additional information about the initiative is presented in Chapter 10.

Chicago Signs Urban Migratory Bird Treaty

Chicago is one of five U.S. signatory cities to the Urban Conservation Migratory Bird Treaty, having signed in 2000. The treaty commits the U.S. Fish and Wildlife Service to a long-term partnership with cities and its conservation partners for the benefit of migratory birds. The Urban Conservation Treaty pilot program was started in 1999 when the City of New Orleans became the first Urban Conservation Treaty city. The Service hopes to use these agreements as models for bird conservation in other cities in future years.

The Urban Conservation Treaty provides a framework to support initiatives that improves the area's ability to sustain bird populations. In addition to working with the City and Parks District to incorporate bird- friendly landscaping into Chicago's parks and open spaces, the treaty partners will launch a campaign to educate Chicago-area homeowners about bird-friendly spaces in their back yards. Partners coordinate migratory bird education programs and outreach activities to inform the public about the benefits and needs of urban and migratory birds. Many of these birds stop in Calumet area wetlands, in city parks and forest preserves, and in backyards across the city. Urban and migrant birds also flock to spots in Chicago such as the Department of Environment's North Park Village Nature Center, which contains woodland, wetland, prairie and savannah habitat.

More than 7 million birds pass through the Chicago area during their spring and fall migrations, following the Lake Michigan shoreline and stream corridors such as those on the Chicago River. Treaty partners will classify and map key habitat for migratory birds along the lakefront and river, and in parks, cemeteries and other open spaces. They will also develop and implement recommendations for conserving and enhancing that habitat.

Among the actions Chicago is taking is to work with building owners to dim bright lights on skyscrapers to protect birds during migration season. Birds become confused by bright lights and can lose their way. Many crash into brightly lit skyscrapers and become injured or die. Depending on the weather, tens of thousands of birds can fly over Chicago in a single night and hundreds of birds might be killed at one building on a night of heavy migration. The city also provides information on landscaping with birds in mind, avoiding using pesticides, keeping cats indoors, and modifying hazardous windows.

More information is available at the City of Chicago website at:
www.cityofchicago.org/Environment/BirdMigration/sub/main.html

Measuring and Monitoring Lake Michigan's Ecological Changes

The U.S. EPA Region 5 is undertaking an effort to identify critical ecosystems and their status that are most sustainable in the Great Lakes basin. The EPA Region 5 Critical Ecosystems Team undertook a three-year study that has produced a physical baseline built on 1994 Land Satellite imagery (Landsat). The result is a GIS-based tool that can characterize landscapes based on three ecological criteria: (1) ecological diversity, (2) sustainability, and (3) rarity of species and landcover. The combination of these criteria identify high quality ecosystems. The modeling can also pinpoint ecosystems that are not protected, in public ownership or environmental management programs. Areas of highest diversity can be mapped against areas of lowest sustainability to highlight the richest ecosystems that are currently being threatened by chemical, physical or biological stressors. A low sustainability rating results from habitat fragmentation, pavement color, and other impairments.

This information can be used to help refine restoration and protection targets for the Lake Michigan basin as well as document the areas of change and trends. Once the model is peer reviewed and resources are identified to run the model with the new 2000 data, a comparison with the Lake Michigan 1994 baseline status can be made. The National Land Cover Data Base is a

cooperative project including USEPA, U.S. Geological Survey (USGS) and the National Oceanographic and Atmospheric Administration (NOAA).

Lake Michigan Basin Species of Concern

In March 2003, the status of the Midwestern **gray wolf (*Canis lupus*)** was changed from endangered to threatened. Under new rules, threatened wolves may be killed under certain circumstances. State and Tribal agencies may kill a wolf if it has attacked domesticated animals and is likely to kill again. Private citizens are not allowed to kill a wolf under any circumstances. The change in the gray wolf status comes as populations rise throughout the upper Midwest. More information is available at *http://midwest.fws.gov/wolf/*

According to a 2003 report, "Great Lakes Lake Sturgeon Coordination Meeting, Proceedings of the December 11-12, 2002 Workshop, Sault Ste. Marie, Michigan," **lake sturgeon (*Acipenser fulvescens*)** populations in Lake Michigan continue to sustain themselves, although it is thought that less than 5,000 fish, or below one percent of historic estimates, remain. At least eight tributaries currently support spawning because they have unimpeded connections to Lake Michigan. Sixteen agencies, tribes, and universities are involved in lake sturgeon research and conservation. Extirpated in the Menominee and Wolf Rivers, lake sturgeon is being reintroduced. A 2003 initiative to stock the Milwaukee and Manitowoc Rivers is underway. Plans for additional stocking in southern Lake Michigan are proposed. The lake sturgeon is on the Service's Region 3 draft Species of Concern list. More information is available at *http://greatlakes.fws.gov/GLSturgeonCoordMttg02.pdf*

The **Kirtland's warbler (*Dendroica kirtlandii*)** is a tiny songbird that breeds in the northern jack pine forests of Michigan's Upper and Lower Peninsulas and winters in the Bahamas. One of the first species to be federally-listed as endangered under the Endangered Species Act of 1973, two threats, cowbird nest parasitism and disappearance of its forest habitat, are being addressed aggressively. The U.S. Fish and Wildlife Service is working to intensively manage native jack pine forests and control cowbird nest parasitism. A long term research program with staff from The Nature Conservancy's Great Lakes Office is linking scientists from Michigan and the Bahamas in order to better understand the warbler's life cycle needs. More information is available at *http://midwest.fws.gov/endangered/birds/kirtland/kiwa-facts.html*

The nesting areas for the **piping plover (*Charadrius melodus*)**, a small, sand colored shorebird, include the sandy shores of the Great Lakes. Commercial, residential, and industrial development has eliminated historic nesting sites. The plover is federally-listed as endangered. The presence of gulls, humans, and human-dependent animals such as dogs on sandy beaches has led to nest predation and abandonment. Critical habitat for the Great Lakes piping plover breeding areas was designated on May 7, 2001. On July 5, 2001, the Service designated areas of coastline in eight southern states as critical habitat for the wintering areas of piping plover. In September 2003, the U.S. Fish and Wildlife Service recovery plan for the Great Lakes piping plover was approved. Access to beaches set aside for nesting is being limited and many Michigan residents are formally agreeing to protect this habitat. Piping plover "patrols" have been organized to encourage citizen participation.

Piping Plover
Courtesy of the National Park Service

The **Hine's emerald dragonfly (*Somatochlora hineana*** federally-listed as endangered is found in the calcareous marshes and sedge meadows of Door, Kewaunee and Ozaukee Counties, Wisconsin and the Des Plaines River basin of northeast Illinois . The draining and filling of these wetlands, water pollution, and changes in groundwater are the greatest threats to dragonfly habitat. The U.S. Fish and Wildlife Service finalized the recovery plan for this species in 1991 which will aid in the protection and recovery of the dragonfly and its habitat. More information is available at *http://midwest.fws.gov/endangered/insects/hins_fct.html*

In September 2003, the U.S. Fish and Wildlife Service approved the recovery plan for the **Karner blue butterfly *(Lycaeides melissa samuelis*)**, which is federally-listed as endangered. The caterpillar of this small butterfly feeds only on the leaves of the lupine, which grows in pine barrens and oak savannas. Wisconsin has implemented a statewide Habitat Conservation Plan (HCP) for the butterfly that permits management activities (such as roadside and utility corridor maintenance and timber harvests) in areas that support Karners but ensures that the activities are conducted in ways that conserve and protect the species and its habitat. In the Lake Michigan basin, the recovery plan is focusing on management of black oak savanna habitats in the dune areas of Northwest Indiana and in the savanna and barrens areas in the central sand counties of Wisconsin. Prescribed burning and invasive species control, as well as propagation of wild lupine habitat, is being conducted by the Indiana Dunes National Lakeshore and The Nature Conservancy. Habitat restoration work is ongoing at various Wisconsin sites as well. More information is available at *http://midwest.fws.gov/endangered/insects/kbb/kbb_fact.html*

The **dwarf lake iris (*Iris lacustris)*** is federally-listed as threatened. The habitat of this small plant with deep blue flowers, is being threatened by shoreline residential and second home development, as well as road salting and off-road vehicles.. The U.S. Fish and Wildlife Service is in the process of developing a recovery plan for this species. Implementation of that plan is anticipated to reduce the threats to the species and its habitat and prevent the plant from becoming endangered. Populations are currently being monitored to determine population trends and habitat requirements. More information is available at *http://midwest.fws.gov/endangered/plants/dwarflak.html*

Houghton's goldenrod *(Solidago houghtonii)* is a showy goldenrod found only on the northern Great Lakes shoreline of Lakes Huron and Michigan. This endemic species is threatened by loss of habitat due to increased human activity such as heavy foot and vehicular traffic in shoreline areas. The Michigan Natural Features Inventory is engaging in cooperative conservation efforts with private landowners and developing management plans with public agencies and

Bald Eagles Return to Little Calumet River

Bald Eagles, once thought unable tothrive in and near Chicago, have returned to the city's south side. A boat crew from the Water Reclamation District was taking water samples from the Little Calumet when members spotted the nest and the birds.

Two bald eagles constructed their nest in a treetop overlooking the Little Calumet River, the first time the birds have nested in the area in more than a century.

Bald Eagle
Courtesy U.S. Fish and Wildlife Service

Eagles have rebounded spectacularly since their near demise in the 1970s after the pesticide DDT was banned and the federal government protected the birds as an endangered species.

Chicago-area bird records include two eagle nests in Cook County, Illinois in 1896, then one in 1897. There is no recorded sighting since then.

According to government and private experts, the eagles' return is a sign that efforts to revitalize the pollution-plagued Calumet area are working.

private developers through state-wide permitting and enforcement systems. More information is available at *http://midwest.fws.gov/endangered/plants/houghton.html*

Habitat loss, competition from non-indigenous species, and deer browse are the most common threats to the **eastern prairie fringed orchid (*Platanthera leucophaea*)**, which is federally-listed as threatened. The prairie fringed orchid depend on hawkmoths for pollination and reproduction. Any threat to these insects, such as the use of insecticides, is a threat to the orchid. The orchid is found in the lakeplain prairies of northeastern Illinois and southeastern Wisconsin, as well as in Michigan. A group of experts and volunteers lead by the Chicago Botanic Garden are monitoring and propagating the rare orchid in native prairie remnants in Illinois. Monitoring and restoration efforts are on-going in Wisconsin as well. More information is available at *http://midwest.fws.gov/endangered/plants/prairief.html*

Whooping Cranes are using wetlands in Wisconsin's Lake Michigan watershed as stop over places during migration, and are anticipated to use such areas in the future as breeding and nesting sites.

Next Steps

- Continue to support components of lake basin biodiversity plan though watershed academy grants.
- Identify species-sensitive to ground and surface water interaction.
- Provide GIS tools and land use models in workshops to promote knowledge of and protection of key habitat areas.

Long-Term Objectives

- By 2005, no net loss of wetland acreage and function will be achieved in the basin.
- By 2006, a process for developing biodiversity recovery manuals for major ecosystem types in the Lake Michigan basin will be implemented.
- By 2006, set targets for critical areas (fish spawning areas, dune and swale complexes, wetlands, alvars, prairies, and oak savannas) will be identified, mapped, and presented on line.
- By 2012, the 2004 target acreages will be enhanced, restored, or protected: 1,000 acres of spawning areas (islands, underwater reefs); (example acreages: 12,500 acres of system wetlands; 1,000 acres of isolated wetlands; 1,000 acres of dunes; and 37,500 acres of stream buffers - comments